Herbert H. Johnson

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1931-1989

By John P. Hirth

Herbert H. Johnson, a national leader in the materials field, died October 1, 1989, after a lengthy illness. A longtime member of the faculty at Cornell University, Herb Johnson had been at the forefront of research in materials for thirty years and had been one of the prime movers in the United States in organizing and managing interdisciplinary materials research. In addition to a number of awards, his excellence was recognized by his election to the National Academy of Engineering (NAE) in 1987.

Herb Johnson was born in Cleveland, Ohio, in 1931 and received his early education there. He attended Case Institute of Technology (now Case Western Reserve University) for both his undergraduate and graduate education, achieving a B.Sc. in physics in 1952, an M.S. in physical metallurgy in 1954, and a Ph.D. in physical metallurgy in 1957. He married his wife, Marguerite (Marnie), a charming lady who supported him throughout his career, and together they raised a family of two sons and three daughters.

At Case he worked with A. R. Troiano, also a member of the NAE. Herb's thesis on hydrogen embrittlement in high-strength steels was a seminal achievement that provided the basis for our present understanding of hydrogen embrittlement of steels. His later research work included studies of fracture, fatigue, diffusion, phase transformations,

and dislocation mechanics. However, the study of hydrogen effects in metals remained one of his major interests throughout his career.

Upon graduating from Case, he joined Lehigh University as an assistant professor of metallurgy for the period 1957-1960. Herb then moved to Cornell University, where he remained throughout his career except for a period as visiting professor at the Massachusetts Institute of Technology (1967-1968). While at Cornell he served as chairman of the Department of Materials Science and Engineering (1970-1974) and as director of the Materials Research Laboratory (MRL) (1974-1984).

His research work was characterized as being thoughtfully conceived, innovative, carefully performed, and significant. He was consistently productive, including his periods of administrative responsibility, and produced a truly classic paper every five or ten years. One of his papers on fracture mechanics has been designated a citation classic. In recognition of his research accomplishments, he was named a Case scholar, a fellow of the American Society for Metals, and a councillor of the Materials Research Society. Also, he delivered the Campbell Lecture of the American Society for Metals. He was invited to present numerous keynote/plenary lectures as well.

In his work he had a keen sense of seeking the fundamental mechanisms for processes. As a consequence, his work has withstood the test of time and remains valid today. Particularly noteworthy was his work on the decohesion mechanics of hydrogen embrittlement, mentioned earlier, where hydrogen accumulates in the stressed region ahead of crack tips and there promotes crack propagation; on hydrogen permeation and trapping in metals; and more generally on environmental degradation. In his last few years, he innovatively used techniques from the semiconducting processing industry to make nanoscale particles to test size effects on mechanical properties, a contribution to the new field of ultrafine microstructures.

In some of this work he collaborated with others in a most helpful and thoughtful manner.

In addition to his research achievements, Herb Johnson made unique contributions to research management that effectively set the standard for university-based interdisciplinary laboratories. Under his leadership the size and funding of the Cornell MRL grew, making it the largest such laboratory in the National Science Foundation program. One of his major achievements was in the development of state-of-the-art central facilities with a heavy emphasis on networked applications of computers. Another major contribution was in the judicious use of seed funding for new programs and facilities. The many successes included the High Energy Synchrotron Source; the Rutherford back-scattering facility; the MicroKelvin low-temperature facility; and programs in polymer crazing, nonlinear optical materials, and high-pressure effects. He insisted that a significant portion of the program be in support of graduate education, with about one hundred students receiving their Ph.D. degrees during his tenure.

He was extremely effective in governmental and societal committees and boards and was widely sought as a participant. He served with distinction on NAE/National Academy of Sciences panels, was chairman of the solid state sciences committee of the National Research Council, and chaired a number of committees for both the Metallurgical Society and the American Society for Metals. Herb was instrumental in defining and initiating the Center for Materials Science at Los Alamos National Laboratory, and he provided continued advice and collaboration for many years as a member of the External Advisory Committee of the Center. He was incisive in cutting through a discussion with a logical solution and would enliven a debate with his dry humor. On several occasions he was complimented by chairs and others on his ability to resolve complex issues. He could be somewhat stubborn in adhering to his views, but was not adamant when sound alternatives were presented.

For many of us in the materials field, Herb Johnson was a warm friend, a reliable critic, a valuable collaborator, and a respected colleague. He will be greatly missed, though his influence through his lasting contributions will be with us for many years.